(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 February 2018 (15.02.2018)

WIPO | PCT

(10) International Publication Number
WO 2018/029239 A1

(51) International Patent Classification:
G08G 1/0967 (2006.01) *G08G 1/00* (2006.01)
G08G 1/16 (2006.01) *G08G 1/01* (2006.01)
G08G 1/0965 (2006.01) *G08G 1/14* (2006.01)

(21) International Application Number:
PCT/EP2017/070155

(22) International Filing Date:
09 August 2017 (09.08.2017)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
201610648884.0 09 August 2016 (09.08.2016) CN

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,

(54) **Title:** METHOD FOR COORDINATING A PLURALITY OF MOBILE DEVICES; MOBILE DEVICE; COORDINATING DEVICE AND SYSTEM

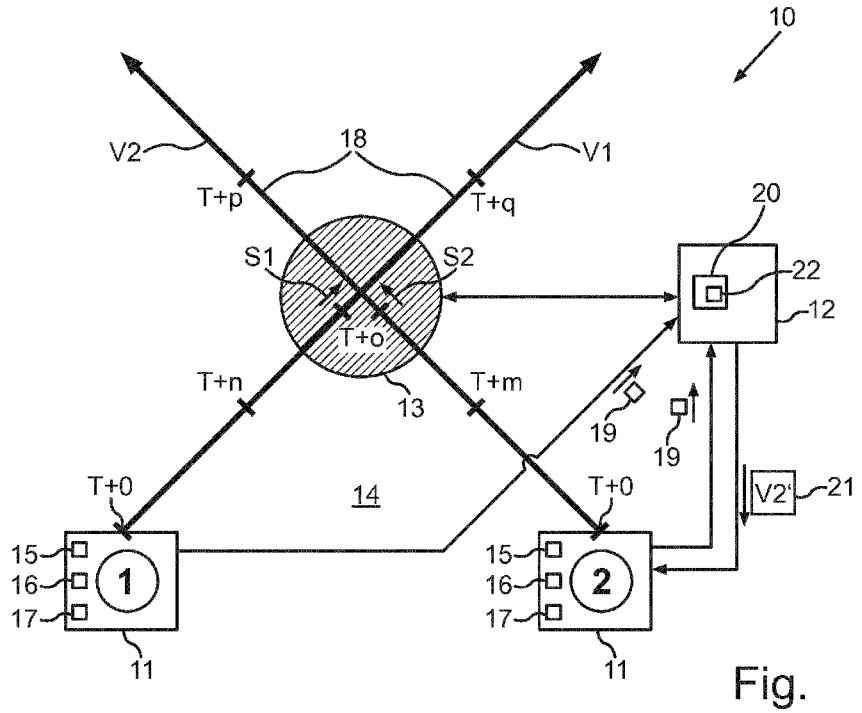

Fig.

(57) **Abstract:** The invention is concerned with a method for coordinating a plurality of mobile devices (11), wherein each mobile device (11) determines at least one intention (V1, V2), wherein each intention (V1, V2) involves an action (S1, S2) to be performed with the device (11) at a specific location (13) and/or at a specific future time point (T+o); and sends out an according announcement signal (19) into the surroundings (14) of the device (11). For each location a respective authority unit (20) receives the announcement signals (19); detects colliding intentions (V1, V2) and alters at least one of the colliding intentions (V1, V2) on the basis of a pre-defined priority criterion (22), such that the collision is resolved. The authority unit (20) sends a correction signal (21) to the corresponding mobile device (11), wherein the correction signal (21) describes the altered intention (V2') for the mobile device (11) in order to replace the colliding intention (V2) of the mobile device (11) with the altered intention (V2').

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TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

Method for coordinating a plurality of mobile devices; mobile device; coordinating device and system

DESCRIPTION:

The invention is concerned with a method for coordinating a plurality of mobile devices. A mobile device can be, for example, a mobile phone or a smart phone or a motor vehicle or a portable electronic device designed for performing the method only. An authority unit coordinates the mobile devices such that a conflict in using a certain location for performing mutually excluding actions is prevented. For example, two motor cannot use the same parking lot at the same time. The invention also comprises the mobile device and a coordinating device which may provide the said authority unit. Finally, the invention is also concerned with a system comprising at least one mobile device and at least one coordinating device.

In an environment where many participants must coordinate their movements and actions, like in a traffic situation, conflicts may arise regarding the use of a certain location for performing a certain action. For example, the users or drivers of two different cars may want to use the same parking lot at the same time point. Another example is the use of a certain road section of a road or highway for driving along this section with a certain minimum speed. Another example (not concerned with motor vehicles) can be a pay desk in the supermarket. In order to prevent a queue at this pay desk, it is advantageous to coordinate to the customers in such a way, that only one customer at a time approaches or uses the pay desk. This can be done on the basis of a mobile device, like a smart phone.

Correspondingly, a location can be, for example, a parking lot, a road segment or a pay desk in a supermarket. An action can then be parking a vehicle, driving a vehicle at a specific minimum speed or paying products at a supermarket.

US 2005/6917876 B2 discloses a route guiding system for vehicles comprising a central computing operators that is being informed of the position of respective vehicles on a particular road network. The computing apparatus calculates the best route for a respective vehicle to take in accordance with the desired destination and the actual position of the vehicle. The calculation of the best route also takes into account traffic conditions on the particular road network.

US 2006/7050987 B2 discloses a method for coordinating travel itineraries of multiple travelers who are leaving from more than one location but are arriving at the same location.

US 2013/8392105 B2 discloses a system for operating a vehicle, more specifically an engine of the vehicle and its energy consumption. The system receives information about the position of the vehicle, determines a route of travel of the vehicle and receives data such as weather and traffic data for this route in order to determine the amount of energy that has to be allocated to the engine of the vehicle to take this route.

It is in object of the present invention to coordinate the actions of several mobile devices at a specific location such that a collision or conflict of their actions at this location are prevented.

The object is achieved by the subject matter of the independent claims. Advantageous developments with convenient and non-trivial further embodiments of the invention are specified in the following description, the dependent claims and the figure.

The invention provides a method for coordinating a plurality of mobile devices. Each mobile device performs the following steps. The mobile device determines at least one intention, wherein each intention involves an action to be performed with the mobile device at a specific location and/or at a specific future time point. The term intention is used in connection with the invention to describe a planned action (such as the use of a certain parking lot or the use of a road section for driving at a specific speed or the use of a pay desk in a supermarket for paying goods) together with the location, where the action is to be performed, and optionally a time point for performing the action. The intention can be described as a data set. The mobile device sends out an announcement signal into the surroundings of the mobile device, wherein

the announcement signal describes the at least one intention. In other words, a description of the at least one intention (action plus location and, optionally, plus future time point) can be received in the surroundings by a receiver such that the receiver receives the information about what is planned by the mobile device.

A second part of the inventive method is perform at at least one authority unit, wherein one authority unit is provided for each location. Such an authority unit can be the already mentioned coordinating device which can be provided at the specific location or in an internet server. The authority unit can be, for example, a program module that is performed or executed by a microcontroller or a microprocessor of such a coordinating device. Alternatively, one of the mobile devices may provide the authority unit.

The authority unit receives the announcement signals that comprise an intention involving or concerning the specific location. In other words, the authority unit is informed about all intentions of all mobile devices that intend to use the location at future time points. The authority unit detects colliding intentions. Such colliding intention are intentions belonging to at least two different mobile devices. Intentions collide, if the intentions indicate, that at least two mobile devices intend to perform their respective action at the location, wherein the actions are mutually excluding actions. For example, an authority unit for a parking lot may detect that two different vehicles intend to park at the parking lot at the same time point. This parking action is a mutually including action, as only one vehicle may be parked at the parking lot at a time. On a road section, two vehicles may plan or intend to drive along this road section at different speeds, which can be a mutually excluding actions, as one vehicle might block or hinder the other vehicle at driving at the planned or intended speed. At a supermarket pay desk, an authority unit for the pay desk may detect that two customers are approaching the pay desk for paying. As only one customer can pay at a time, these actions of the two customers are mutually excluding.

In order to solve this conflict (colliding intentions), the authority unit alters at least one of the colliding intentions on the basis of a predefined priority criterion, such that the collision is resolved. In other words, the authority unit decides, which mobile device may perform the action as intended and which other mobile device must alter its intention, i.e. the action, the location, and/or the time point. This results in an adapted or changed or altered inten-

tion for that mobile device. Thus the performance of the mutually excluding actions at the location point is prevented. In other words, the mobile device receiving the correction signal alters its intention and performs the planned or intended action at a different time point or performs an alternative action according to the correction signal.

As was already described, the mobile device can be a smart phone, a vehicle, especially a motor vehicle, a portable device. For determining the intention, that is the planned action, the location and/or the future time point, the mobile device may e.g. receive an input from a user. The user may thus define the intention. Another way of determining an intention is to evaluate past usages of the mobile device. In a motor vehicle, the intention can be derived from a navigation destination as it can be programmed in a navigation system. In a motor vehicle the intention can also be derived from a route planning device for an automatic or autonomous driving system.

The invention provides the advantage that conflicts between two or more mobile devices are prevented before the conflicts actually arise at a certain location at a specific time point. Before this time point the collision of intentions is detected and resolved such that the mobile devices arrive at the location at different time points and/or with different actions intended such that the devices will not attempt to perform the mutually excluding actions at the specific location.

The invention also comprises optional embodiments that provide features which afford additional technical advantages.

In one embodiment the method comprises that each mobile device determines its respective intention or its several respective intentions and then sends out the corresponding announcement signal repeatedly, especially at a rate of more the twice per hour. In other words the rate for updating the information about the intention, that is the rate of sending out an updated corresponding announcement signal, is greater than two per hour, in particular greater than one per minute. In other words, a receiver in the surrounding of the device does not need to memorize or track the intention on the basis of an internal memory and/or a model. Instead, the current or updated intention is delivered by the mobile device itself at a rate high enough to keep the surroundings informed and to signal any change of intention in time such that intentions of other mobile devices can be adapted or corrected accordingly.

In order to signal the at least one intention of a mobile device, the announcement signal preferably describes a vector indicating for each intention the action together with the location and/or the future time point. Using a description based on a vector provides the advantage that a whole route of the mobile device including several different locations that will be passed along the route may be described with this one vector. Thus by sending out the announcement signal describing this vector, any location passed by the mobile device at future time point is informed about the intended use of the location for performing a specific action.

As already described, for at least one location a stationary coordinating device may be provided. Such a coordinating device receives all the announcement signals comprising an intention involving or concerning the location. The authority unit for this location is provided by the coordinating device, i.e. the stationary coordinating device coordinates all mobile devices that intend or plan to use the location. This embodiment provides the advantage that is that it is guaranteed that a receiver is provided that receives the announcement signals for this location. Thus, for a mobile device that does not receive any correction signal it is clear or guaranteed that the mobile device may use the location according to its intention as announced by the announcement signal.

Alternatively, in the surroundings the mobile devices may form an ad-hoc network for exchanging their announcement signals independently of any stationary coordinating device. Thus, each mobile device sends out its announcement signal and if another mobile device receives this announcement signal this receiving mobile device may then determine the colliding intentions itself. The respective authority unit for at least one location is thus provided by one of the mobile devices. This provides the advantage that the mobile devices organize themselves without the need of a stationary coordinating device.

If colliding intentions are detected, the priority criterion is used for resolving these collisions. Preferably, the priority criterion is the first-come first-serve-principle. In other words, the first mobile device that announces a certain intention regarding a certain location at a certain time point receives the authority or allowance to use the location as intended. Any mobile device announcing a colliding intention will have to correct or to alter its intention as

commanded by the correction signal. If, for example, a supermarket or another selling point offers a product at a special price, and only one product is left, mobile devices may announce the intention of their user to come to the store and buy the product. The first device to announce the intention of buying the last product will then be the one that actually receives the confirmation that the product is still available wherein all other mobile devices receive or are provided a correction signal indicating that the purchase of the product is not possible anymore.

As was already described, the inventive method may be used for a great number of different aspects. The intentions that may be determined by a mobile device, may comprise at least one of the following actions and/or locations and/or time points: driving speed, acceleration, breaking, steering angle, steering speed, a mental condition (sleep, rest), supply condition (recharging, refueling), a preferred route, a preferred position at a location, a parking lot, a specific fuel station (for example a gas pump), a drive-in time at a drive-in, a shopping order with estimated pickup time, a rendezvous, an avoiding of a specific other device.

The method requires that mobile devices send out announcement signals for announcing or signaling planned intentions. Preferably, the announcement signals are updated regularly at a high rate such as more than twice per hour or more than once per minute. In order to smoothly coordinate the intentions or movements of a large number of mobile devices, it is preferred that the announcement signal of a mobile device is sent out as an optical signal on the basis of an OWC-standard (OWC - optical wireless communications) and/or a LiFi-standard (LiFi - light fidelity). For example, the announcement signal may be send out by a motor vehicle using the headlamp of the motor vehicle such that the stream of light generated by the headlamp is modulated on the basis or as a function of the announcement signal. As receiving elements in the surroundings, the streetlights can be used that receive the announcement signals and transfer the received announcement signals to stationary coordinating devices at the locations described in the announcement signals. Also, other mobile devices, such as other motor vehicles, may receive the optical signals in the surroundings of the sending motor vehicle and may thus form the described ad-hoc network.

In order to perform the inventive method, the mobile devices are needed. The invention also comprises a mobile device that comprises the following

elements. A planning unit is provided that is designed to determine at least one intention of a user of the mobile device and/or the at least one intention of a control unit controlling the movement of the device. Such a control unit may be an autopilot system of a vehicle. Each intention involves an action to be performed with the mobile device at a specific location and/or at a specific future time point. The mobile device also comprises a sending unit that is designed to send out an announcement signal into the surroundings of the device, wherein the announcement signal describes the at least one intention. Preferably, the sending unit is designed to send out the announcement signal as an optical signal. For example, an OWC-standard and/or a LiFi-standard can be used. Further, the mobile device comprises a receiving unit that is designed to receive at least one correction signal describing at least one altered intention that corresponds to the at least one intention and to indicate the at least one intention to the user and/or the control unit. Each altered intention corresponds to one of the described planned intention. The altered intention indicates, how the intended or planned action is to be modified concerning the action, the location and/or the time point. If a user is using the mobile device, the user is informed about the altered intention. If the mobile device is controlled by a control unit, the control unit is informed about how to alter the controlling of the movement of the mobile device. In other words, the mobile device will change the intention on the basis of a received correction signal describing an altered intention. Thus, the mobile device will coordinate each intention with at least one other mobile device such that no collision of intentions results at any future time point.

The correction signal may be received from an authority unit. As already described, several mobile devices may coordinate their intentions without or independently from a stationary coordinating device. This is done by forming an ad-hoc network. Accordingly, the mobile device may comprise an authority unit that is designed to receive at least one foreign announcement signal from another mobile device and that is designed to coordinate the at least one intention with the respective foreign intention described in the at least one foreign announcement signal. This is done by generating a correction signal on the basis of a predefined priority criterion. The correction signal may then be received by the receiving unit of the mobile device itself. Alternatively, the correction signal may concern the at least one foreign intention of the foreign or other mobile device such that the correction signal is send out to the at least one other mobile device.

Preferably, the mobile device is a motor vehicle. Thus the invention can be used to coordinate traffic of motor vehicles. In one specific embodiment, the motor vehicle is designed to drive autonomously. In other words, the mobile device comprises a control unit that is an autopilot system for driving the motor vehicle without the control of a driver. This allows to coordinate the movement of motor vehicles in a way that prevents for example traffic jams.

In order to provide an authority unit at a specific location, the invention also comprises a coordinating device for coordinating actions of a plurality of mobile devices at a specific location. The coordinating device can be for example an apparatus or an electronic circuit or a microcontroller or a microprocessor. The coordinating device comprises an authority unit that can be provided as a program module of the coordinating device. The authority unit is designed to receive announcement signals from mobile devices wherein each announcement signal describes an intention involving a specific action of the mobile device at the location. Optionally, the intention may also describe a specific future time point for performing the action at the location. The authority unit is also designed to detect colliding intentions, wherein the colliding intentions comprise that at least two of the mobile devices intend to perform their respective action at the location, wherein the actions are mutually excluding actions. The collision may also comprise that the actions are to be performed at the same time point. The authority unit is designed to alter at least one of the colliding intentions on the basis of a predefined priority criterion such that the collision is resolved. The authority unit is also designed to send a correction signal to the corresponding mobile device. The correction signal describes the altered intention for the mobile device, such that the mobile device may adapt its intention that causes the collision.

The invention also comprises embodiments of the mobile device and the coordinating device that comprise features that have already been described in connection with the inventive method. Thus, the corresponding embodiment of the inventive mobile device and the inventive coordinating device will not be described here.

Finally, by combining at least one coordinating device with several mobile devices, an inventive system for coordinating actions of a plurality of mobile devices at at least one location is provided. Thus, for each location, a respective authority unit is provided by the at least one coordinating device. A coor-

dinating device can be for example a server of the Internet that provides several authority units, one each for a specific location.

In the following an exemplary implementation of the invention is described. The single figure (Fig.) shows a schematic illustration of an embodiment of the inventive system.

The embodiment explained in the following is a preferred embodiment of the invention. However, in the embodiment, the described components of the embodiment each represent individual features of the invention which are to be considered independently of each other and which each develop the invention also independently of each other and thereby are also to be regarded as a component of the invention in individual manner or in another than the shown combination. Furthermore, the described embodiment can also be supplemented by further features of the invention already described.

The figure shows a system 10 comprising mobile devices 11 and a coordinating device 12 for a location 13 in surroundings 14 of the mobile devices 11. The mobile devices 11 are distinguished in the figure by different device numbers 1, 2. Each mobile device can be, for example, a motor vehicle or a smart phone or a tablet-PC or a portable electronic device. The mobile devices 11 may be used by users and may be carried the users on their way or movement through the surroundings 14. The location 13 may be a section of a road, a parking lot, a pay desk, to name a few, non-limiting examples.

Each mobile device may comprise a planning unit 15, a sending unit 16 and a receiving unit 17. A planning unit 15 may be provided as a program module for a microcontroller or a microprocessor. A sending unit 16 may be provided as an optical sending unit that may send out a light signal, such as modulated light. The sending unit 16 may send out an optical signal on the basis of an OWC-standard and/or a LiFi-standard. A receiving unit 17 may be provided as a receiver for an optical signal and may comprise a photo sensor like a photo diode.

The planning unit 15 of each mobile device 11 determines the planned or intended use or movement of each mobile device 11. A user of the mobile device 11 may indicate the planned use or movement by using an input device like e.g. a touchscreen. Additionally or alternatively, the planning unit may estimate the intended use or movement of the mobile device on the ba-

sis, for example, of a programming of a navigation system and/or on the basis of past regular uses of the mobile device and the current time of day T.

The planning unit 15 may detect that a movement along a specific road or route will take place. Then, the planning unit 15 determines several intentions describing different locations that will be passed during the movement of the mobile device 11. The planning unit 15 describes the at least one determined intention as an intention vector V1, V2, that describes the planned route of movement as, e.g., an array of locations. In the figure the route or movement is illustrated as a straight line 18. The intention vectors V1, V2 describes also the different future time points T+n to T+q, indicating when the planned or in intended locations will be reached by the respective mobile device 11.

The intention vectors V1, V2 start at the current time points T+0 (T plus zero). The intention vectors V1, V2, that is the at least one intention of each mobile device 11, are sent out as an announcement signal 19 by the sending units 16 into the surroundings 14.

The coordinating device 12 may receive the announcement signals 19. The coordinating device 12 can be for example an Internet server. The coordinating device 12 may comprise a microcontroller and/or a microprocessor. The coordinating device 12 provides an authority unit 20 for the location 13. Alternatively, the authority unit 20 may be provided by one of the mobile devices 11.

On the basis of the announcement signals 19, the authority unit 20 determines that at time points T+o the mobile devices 11 plan or intend to use the location 13, e.g. a crossroads or a section of a highway. The intention vector V1, V2 may also comprise data concerning a planned driving speed S1, S2 of travel. This planned driving speed S1, S2 represents an action. The authority unit 20 detects that at time point T+o both devices 11 may not use locations 13 at the same time, if the driving speeds S1, S2 are used. These actions are thus mutually exclusive. For example, mobile device 1 plans to pass by location 13 at a speed S1 while at the same time T+o device 2 plans to pass by location 13 at a speed S2, wherein the speeds S1, S2 are different. This may result in a traffic jam, if the faster device 11 drives behind the slower device 11.

The authority unit 20 resolves the conflict by e.g. adapting the two speeds S1, S2. Alternatively, the time point T+o may be altered in one of the intention vectors V1, V2.

The authority unit 20 generates a correction signal 21 which signals to one of the mobile devices 11, how its intention vector must be altered into an altered intention vector V2' in order to prevent a future collision of intentions. In the figure the device 2 receive the correction signal 21 and adapts its intention vector V2 to intention vector V2' such that both devices 11 will reach location 13 either at different time point in the future or at the same time point T+o, but with adapted speeds such that they drive e.g. at the same speed and can thus drive one behind the other.

Thus each mobile device 11 is a sending and receiving device, which calculates and sends future conditions or plans or intentions to other devices or to a stationary receiver/sender installation, i.e. a coordinating device. A mobile device can also receive and interpret intentions of other devices to block/warn, reserve/book or broadcast route or intentions of the future.

There are many future intentions possible, like, e.g., speed, acceleration, breaking, steering, angles and steering speed, mental conditions, supply conditions, preferred route, preferred positions at locations, wanted parking lot, wanted fuel station (gas pump), drive-in time at drive-ins, shopping order with estimated pickup time, a rendezvous point (single-multiple), avoiding objects in future.

The authority unit 20 is able to combine multiple intentions by handling out priorities and giving feedback to the devices. It has the authority protocol which finally approves and books the intentions. One possible priority criterion 22 can be the first-come first-serve principle. In a preferred embodiment, the corresponding announcement signals 19 and the correction signal 21 are broadcast on the basis of OWC/LiFi.

Thus using motor vehicles as mobile devices traffic safety can be guaranteed.

Overall, the example shows how the invention provide a mobile intention announcing device and an intention authority device.

PATENT CLAIMS:

1. Method for coordinating a plurality of mobile devices (11), wherein each mobile device (11):
   - determines at least one intention (V1, V2), wherein each intention (V1, V2) involves an action (S1, S2) to be performed with the device (11) at a specific location (13) and/or at a specific future time point (T+o); and
   - sends out an announcement signal (19) into the surroundings (14) of the device (11), wherein the announcement signal (19) describes the at least one intention (V1, V2);

   and for each location a respective authority unit (20):
   - receives the announcement signals (19) that comprise an intention (V1, V2) involving the location (13);
   - detects colliding intentions (V1, V2), wherein the colliding intentions comprise that at least two of the mobiles devices (11) intend to perform their respective action (S1, S2) at the location (13) and/or at the same time point, wherein the actions (S1, S2) are mutually excluding actions (S1, S2);
   - alters at least one of the colliding intentions (V1, V2) on the basis of a pre-defined priority criterion (22), such that the collision is resolved; and
   - sends a correction signal (21) to the corresponding mobile device (11), wherein the correction signal (21) describes the altered intention (V2') for the mobile device (11) in order to replace the colliding intention (V2) of the mobile device (11) with the altered intention (V2').

2. Method according to claim 1, wherein each mobile device (11) determines its at least one intention (V1, V2) and sends out the corresponding announcement signal (19) repeatedly, especially at a rate greater than two per hour, in particular greater than one per minute.

3. Method according to any of the preceding claims, wherein the announcement signal (19) describes a vector (V1, V2) indicating for each intention the action (S1, S2) together with the location (13) and/or the future time point (T+o).

4. Method according to any of the preceding claims, wherein for at least one location (13) a stationary coordinating device (12) receives the announcement signals (19) comprising an intention (V1, V2) involving the location (13), wherein the authority unit (20) of the location (13) is provided by the coordinating device (12).

5. Method according to any of the preceding claims, wherein in the surroundings (14) the mobile devices (11) form an ad-hoc-network for exchanging their announcement signals (19) and finding colliding intentions (V1, V2) independently of any stationary coordinating device (12), wherein the respective authority unit (20) for at least one location (13) is provided by one of the mobile devices (11).

6. Method according to any of the preceding claims, wherein the priority criterion (22) is the first-come-first-serve-principle.

7. Method according to any of the preceding claim, wherein the intentions (V1, V2) comprise at least one of the following actions (S1, S2) and/or locations and/or time points: speed (S1, S2), acceleration, breaking, steering angle, steering speed, a mental condition, a supply condition, a preferred route, a preferred position at a location, a parking lot, a specific fuel station, drive-in time at a drive-in, shopping order with estimated pick-up time, a rendezvous, an avoiding of a specific device.

8. Method according to any of the preceding claim, wherein the announcement signal (19) is send out as an optical signal on the basis of an OWC-Standard and/or a LiFi-Standard.

9. Mobile device (11) comprising:
   - a planning unit (15) that is designed to determine at least one intention (V1, V2) of a user and/or of a control unit controlling the movement of the device (11), wherein each intention (V1, V2) involves an action (S1, S2) to be performed with the mobile device (11) at a specific location (13) and/or at a specific future time point (T+o),
   - a sending unit (16) that is designed to send out an announcement signal (19) into the surroundings (14) of the device (11), wherein the announcement signal (19) describes the at least one intention (V1, V2),

- a receiving unit (17) that is designed to receive at least one correction signal (21) describing at least one altered intention (V2') that corresponds to the at least one intention (V1, V2) and to indicate the at least one altered intention (V2') to the user and/or control unit.

10. Mobile device (11) according to claim 9, comprising an authority unit (20) that is designed to receive at least one foreign announcement signal (19) from another mobile device (11) and to coordinate the at least one intention (V1, V2) with the respective intention (V1, V2) described in the at least one foreign announcement signal (19) by generating a correction signal (21) on the basis of a pre-defined priority criterion (22).

11. Mobile device (11) according to claim 9 or 10, wherein the mobile device (11) is a motor vehicle.

12. Coordinating device (12) for coordinating actions (S1, S2) of a plurality of mobile devices (11) at a location (13), comprising an authority unit (20) that is designed

- to receive announcement signals (19) from mobile devices (11), wherein each announcement signal (19) describes an intention (V1, V2) involving a specific action (S1, S2) of the mobile device (11) at the location (13),
- to detect colliding intentions (V1, V2), wherein the colliding intentions (V1, V2) comprise that at least two of the mobiles devices (11) intend to perform their respective action (S1, S2) at the location (13), wherein the actions (S1, S2) are mutually excluding actions (S1, S2),
- to alter at least one of the colliding intentions (V1, V2) on the basis of a pre-defined priority criterion (22), such that the collision is resolved, and
- to send a correction signal (21) to the corresponding mobile device (11), wherein the correction signal (21) describes the altered intention (V2') for the mobile device (11).

13. System (10) for coordinating actions (S1, S2) of a plurality of mobile devices (11) at at least one location (13), wherein the system (10) comprises at least one coordinating device (12) according to claim 12 and several mobile devices (11) according to any of the claims 9 to 11,

wherein the at least one coordinating device (12) provides a respective authority unit (20) for the at least one location (13).

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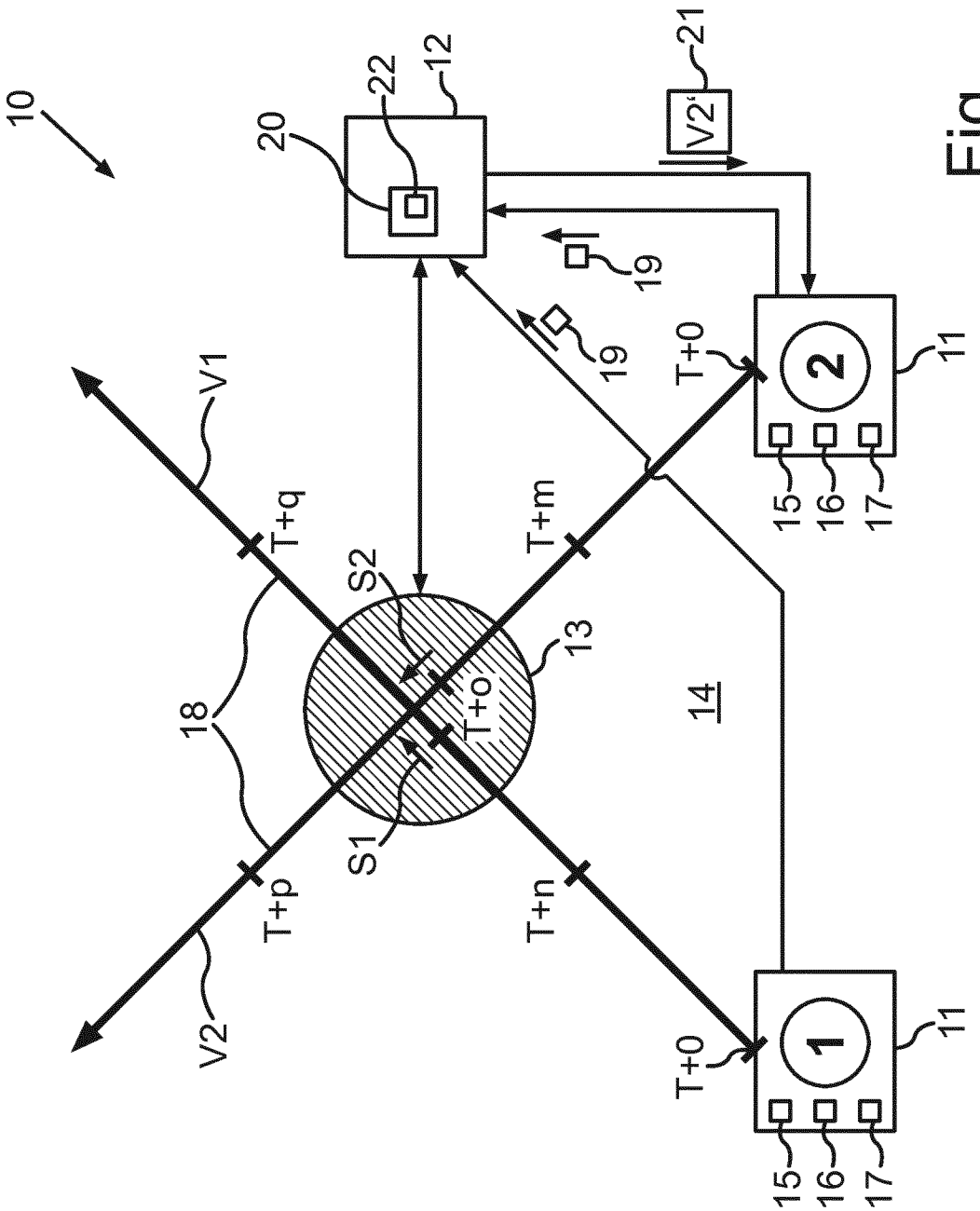
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T+0
2
11
15
16
17
V1
T+q
T+m
S2
13
18
T+o
14
S1
T+p
T+n
V2
T+0
1
11
15
16
17

Fig.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2017/070155

A. CLASSIFICATION OF SUBJECT MATTER
INV. G08G1/0967 G08G1/16 G08G1/0965 G08G1/00 G08G1/01
G08G1/14
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G08G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013/059558 A1 (GEHLEN GUIDO [DE] ET AL) 7 March 2013 (2013-03-07) paragraph [0071] - paragraph [0072]; figure 1	1-4,6,7, 9-13
X	WO 2014/191659 A1 (PEUGEOT CITROEN AUTOMOBILES SA [FR]) 4 December 2014 (2014-12-04) paragraphs [0037], [0043] - paragraph [0050]; figure 1	1,5,8,10
X	US 6 810 321 B1 (COOK FRED S [US]) 26 October 2004 (2004-10-26) column 3, line 44 - column 4, line 16; figure 1	1-4,6,7, 9-13

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 November 2017	28/11/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Malagoli, M

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Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2005/001386 A2 (HARMAN BECKER AUTOMOTIVE SYS [DE]; LAPPE DIRK [DE]; WOLF STEFAN [DE];) 6 January 2005 (2005-01-06) page 4, last paragraph - page 7, paragraph second -----	1-13
A	WO 2016/046665 A1 (SPARKCITY COM LTD [IL]) 31 March 2016 (2016-03-31) paragraph [0164]; figures 11A-11B -----	1-13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2017/070155

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